# PATENT SPECIFICATION

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## (54) FLAME SPREADING ATTACHMENT FOR A BLOW TORCH

(71) We, NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORPORATION, a Japanese company, of No. 1-6, 1-chome, Uchisaiwai-cho, Chiyoda-ku, Tokyo, Japan and SUMITOMO ELECTRIC INDUSTRIES, LTD., a Japanese company, of No. 15 Kitahama-5-chome, Higashi-ku, Osaka, Japan, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:-

The present invention relates to a flame spreading attachment which may be detachably secured about a nozzle of a gasoline-, propane-or kerosene-fueled blow torch, for spreading the flame so as to meet the uses of the torch.

Gasoline-, propane- and kerosene fueled blow torches have been heretofore used as portable heaters for heating a thermoshrinkable synthetic resin tube which shrinks when it is subjected to heat. However, these blow torches have a disadvantage in that the surface of the thermoshrinkable tube tends to be damaged by the heat since the surface thereof is locally heated at high temperatures due to the concentrated blowing of the flame onto it. Further defects are that the operation for heating the whole surface of the thermoshrinkable tube requires a relatively long time since the blowing of the flame heats only a limited area of the tube by the concentrated flame, and also the flame is often blown out by the wind during operation.

According to the present invention, there is provided a flame spreading attachment for a blow torch, said attachment comprising a frustoconical hollow hood having adjacent its reduced end a sleeve for detachable connection about a nozzle of a blow torch, and a flame spreading element having at least one conical surface, said element being mounted within the hood in axial alignment there with so that a conical end of the conical surface is directed towards the sleeve.

The flame spreading attachment of the invention reduces the abovementioned defects and makes it possible to spread the flame over a wider area and to moderate the heating temperatures.

In order that the invention may be more clearly understood, reference will now to be made to the accompanying drawings showing preferred embodiments of the present invention, and in which:-

*Figure 1* is a side view of a blow torch with one embodiment of a flame spreading attachment according to the invention secured thereto;

*Figure 2* is an enlarged transverse section showing a connecting structure for connecting a flame spreading attachment to a nozzle of a blow torch;

*Figure 3* is a side view illustrating a modified connecting structure for connecting a flame spreading attachment to a nozzle of a blow torch;

*Figures 4* and *5* are respectively side and front views of one form of a flame spreading element;

*Figures 6* and *7* are respectively side and front views showing a modification of the flame spreading element;

*Figures 8* and *9* are respectively side and front views showing a further modification of the flame spreading element; and

*Figures 10* to *12* are partially sectioned side views, respectively illustrating the operation of a flame spreading attachment which incorporates each of the flame spreading elements corresponding to Figures 4 to 9.

Referring now to Figure 1 which shows one embodiment of a flame spreading attachment 10 according to the invention attached to a blow torch 30, the attachment 10 comprises a substantially frustoconical

hollow hood 11, a connecting sleeve 12 which integrally extends from the reduced end of the hood 11, and a biconical flame speading element 20 which is supported within the hollow hood 11 adjacent the reduced end thereof and in axial alignment therewith by means of a rod 21. The rod 21 is fixed at one end to the element 20, and at the other end is connected to the connecting sleeve 12. The hood 11 and element 20 are made of stainless steel, but may be made of iron or other relatively heat resistant materials.

The flame spreading element 20 can be fixed to the connecting sleeve 12 by brazing the rod 21 to the sleeve, but preferably, is detachably connected to the sleeve 12. As shown in Figure 2, the periphery of the sleeve 12 is provided with an axial hole 13, in which is inserted the free end of the rod 21, which is secured by means of a set screw 14 radially screw threaded into the periphery of the sleeve 12. Figure 3 shows another manner of detachably securing the rod 21 to the sleeve 12. The periphery of the sleeve 12 carries a member 15 which has a hole 16 in which is inserted the free end of the rod 21 through an opening provided in the periphery of the hood 11. A set screw 17 is screw threaded in the member 15 so as to secure the free end of the rod 21 in the hole 16.

Sleeve 12 is securely mounted on a nozzle 31 of the blow torch 30 by means of several screws 18, thus enabling the flame spreading attachment 10 to be detachably attached to the blow torch 30.

Various other embodiments of the flame spreading element 20 are described with reference to Figures 4 to 9, in which similar parts and elements are designated by similar reference numerals.

As shown in Figures 4 and 5, the flame spreading element 20 is a conical cup which has an outer conical surface 22 of which the included angle $\theta_1$ is between 60° and 120°, which is effective for spreading the flame.

In Figures 6 and 7, the flame spreading element 20 is of substantially the same shape as that of Figure 4, except that a plurality of penetration holes 23 are provided in the element 20 in the axial direction thereof at a vertex and its peripheral portion. In this flame spreading element 20 also, the flame can be effectively spread at a vertical angle $\theta_1$ between 60° and 120°. If the angle is over 120°, the flame spreads too widely to effect heating, while if it is less than 60°, the flame spreads only over a narrow area.

Figures 8 and 9 show a flame spreading element 20 which is of a shape such that a pair of conical elements 24 and 25 having the same base diameter are joined together with their opposing bases engaged with each other. In this biconical flame spreading element 20 also, when the included angle $\theta_2$ of the inner conical element 24 adjacent the flame nozzle 31 and the angle $\theta_3$ of the outer conical element 25 directed towards the outlet of the hood 11 are between 60° and 120°, they are effective for spreading the flame, similarly to the flame spreading elements of Figures 4 and 6. In addition, in the case where $\theta_2$ is equal to or larger than $\theta_3$, the temperature of the flame spouted from the hood 11 tends to be uniform over the cross-section of the flame. As shown by the phantom lines in Figure 8, the conical ends of the element 20 may be rounded. Also the conical ends of the elements 20 of Figures 4 and 6 may be rounded.

Although not shown in the drawings, the cross-sectional shapes of the hood 11 and element 20 may be polygonal.

The operation of the flame spreading attachment 10 as constructed above is explained with reference to Figures 10 to 12.

Figure 10 shows the flame spreading attachment 10 incorporating the flame spreading element 20 of Figure 4. The flame jetted from the nozzle 31 of the blow torch 30 is forced to run along the passage defined by the conical surface 22 of the element 20 and an inner periphery 19 of the hood 11, while being spread, as shown by the dotted lines in Figure 10. After passing through the flame spreading element 20, the flame spreads along the inner surface 19 of the hood 11. The flame is spouted from the outlet of the hood 11 in the form of a ring in cross-section. The temperatures of this spouted flame are higher at the outer part of the ring-like section than at the inner part thereof.

As shown by the dotted lines in Figure 11, with the attachment 10 incorporating the flame spreading element 20 of Figure 6, the flame jetted from the nozzle 31 spreads in the same manner as that of Figure 10, but a part of the flame enters within the flame spreading element 20 through the holes 23 which are provided parallel to the axis of the element 20, i.e., in the direction that the flame is jetted from the nozzle 31. The flame within the element 20 then spreads along the inner periphery of the element 20, and joins the flame which runs and spreads along the inner periphery 19 of the hood 11. Thus the flame is spouted from the outlet of the hood 11 in a circular form in cross-section, as shown by the dotted arrows. As a result, the temperature of the flame spouted from the hood 11 becomes higher at the central part of the circular section, while the temperature at the outer part of the circular section becomes lower, as compared to the case of Figure 10. That is, the temperature tends to be uniform over the central and peripheral parts of the circular section of the spouted flame.

Figure 12 shows the flame spreading attachment 10 incorporating the flame spreading element 20 of Figure 8. The flame jetted from the nozzle 31 spreads along the passage defined by a conical surface 26 of the element 20 and the inner periphery 19 of the hood 11. Thereafter, a part of the flame running along the surface 26 separates from the other flame at the end portion of the conical surface 26, and flows along a surface 27 of the other conical portion 25, and then joins again to the other flame which is spreading along the inner periphery 19 of the hood 11. The joined flame is spouted from the hood 11, as shown by the dotted arrows. As a result, the temperature of the flame spouted in the form of a circular cross-section becomes higher at the central part thereof and lower at the peripheral part thereof, as compared to the case of Figure 11. Thus the temperature distribution tends to be more uniform. Therefore, when the inner and outer vertical angles $\theta_2$ and $\theta_3$ of the element 20 are suitably selected so as to adjust the branching flow of the flame at the end of the surface 26, the temperature distribution of the flame spouted from the hood 11 can be adjusted to be uniform.

The structure and function of the flame spreading attachment of the present invention are as described above. By means of the present invention, therefore, not only can the flame of the blow torch be widely spread, but also the flame spreading element can be exchanged so as to meet the uses of the torch, thus enabling the adjustment of the temperature for heating a thermoshrinkable tube in a wider range as well as the application of a more uniform heating temperature. Further, the temperature of the flame can be suitably controlled even when the flame is jetted from the blow torch at its maximum rate. Thus, local burning or thermal deterioration of a thermoshrinkable tube due to the concentration of the flame can be avoided. Still further, the operation time for heating the whole tube can be reduced since the flame can be spread widely.

In addition, the flame is unlikely to be blown out by the wind since it is protected by the hood. Even if the flame is blown out by the wind, it can be immediately relit by the blowing of gas from the torch nozzle against the flame spreading element which is still in a heated condition, thus eliminating troubles and assuring economical operation.

WHAT WE CLAIM IS:-

1. A flame spreading attachment for a blow torch, said attachment comprising a frustoconical hollow hood having adjacent its reduced end a sleeve for detachable connection about a nozzle of the blow torch, and a flame spreading element having at least one conical surface, said element being mounted within the hood in axial alignment therewith so that a conical end of the conical surface is directed towards the sleeve.

2. A flame spreading attachment as claimed in claim 1, wherein the flame spreading element is a conical cup having axially directed holes provided in the conical end and in the periphery of the cup.

3. A flame spreading attachment as claimed in claim 1 or 2, wherein the included angle of the conical end is 60° to 120°.

4. A flame spreading attachment as claimed in claim 1, wherein the flame spreading element has a further conical surface at its outer end.

5. A flame spreading attachment as claimed in claim 4 wherein the included angles of both of conical ends are 60° to 120°, and the angle of the conical end directed towards the sleeve is larger than that of the other conical end.

6. A flame spreading attachment as claimed in any preceding claim, wherein the flame spreading element is mounted within the hood by means of a rod one end of which is connected to said flame spreading element and the other end of which is detachably connected to said sleeve.

7. Flame spreading attachments for a blow torch substantially as hereinbefore described with reference to the accompanying drawings.

BARON & WARREN.,
16 Kensington Square,
London, W.8.
Chartered Patent Agents.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1

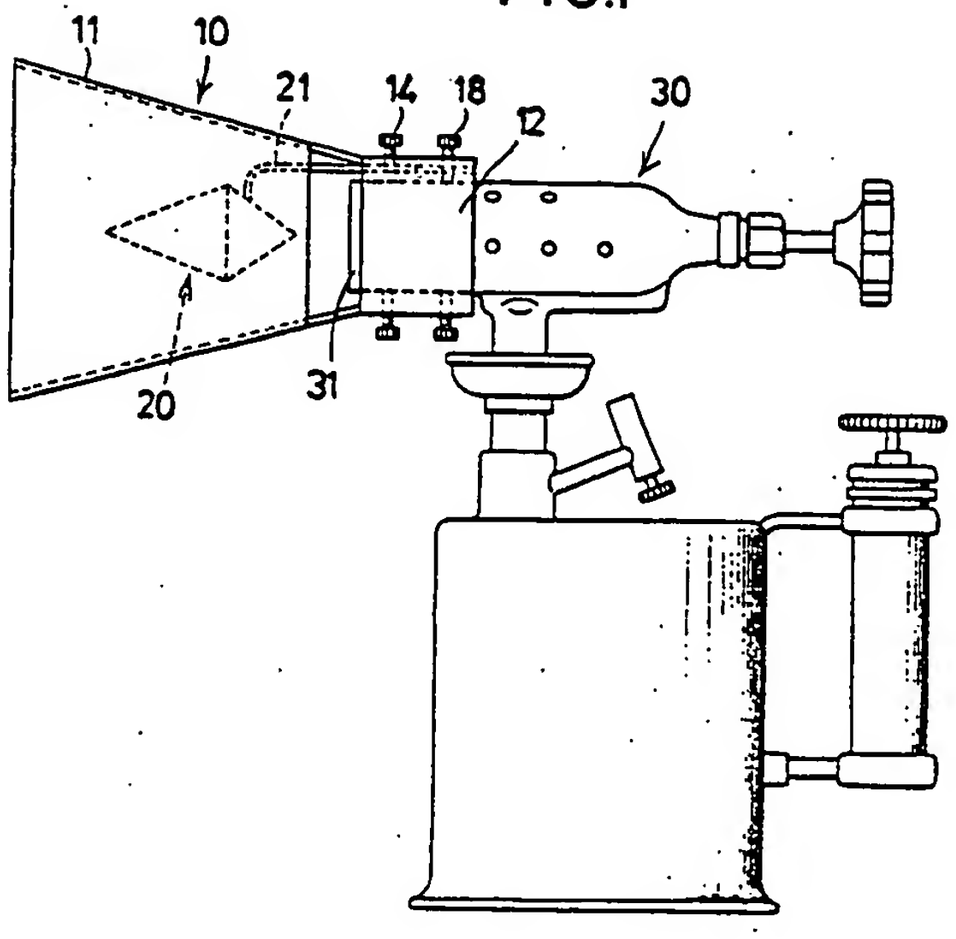



FIG.2

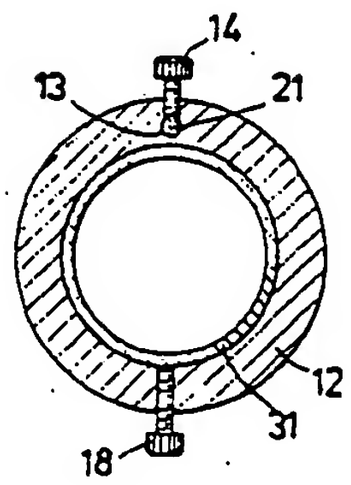
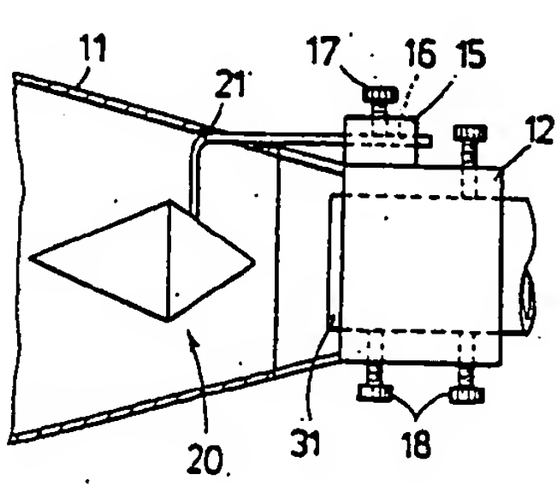



FIG.3



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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

FIG.4

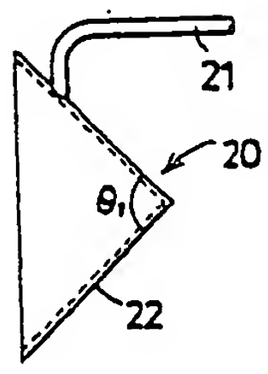



FIG.5

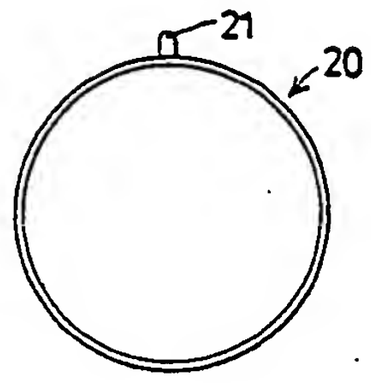



FIG.6

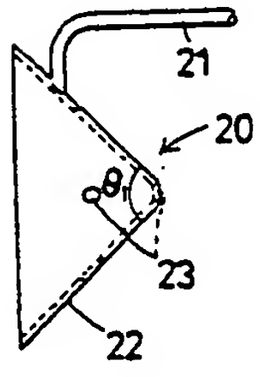



FIG.7

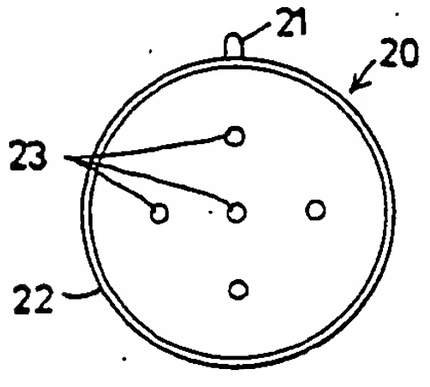



FIG.8

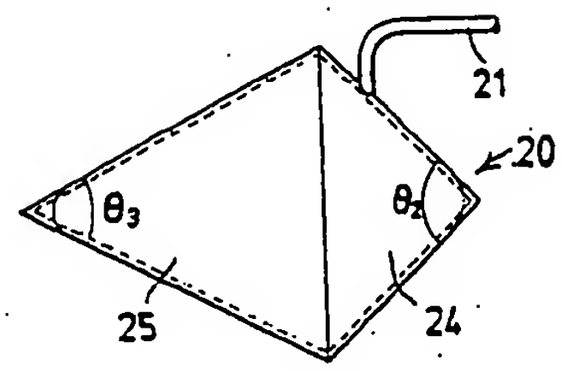
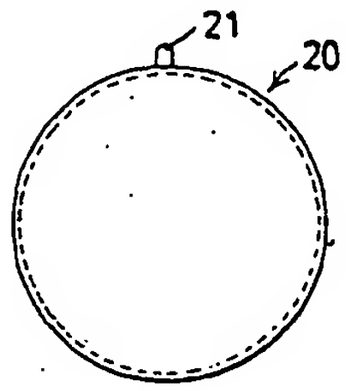



FIG.9



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Sheet 3

FIG.10

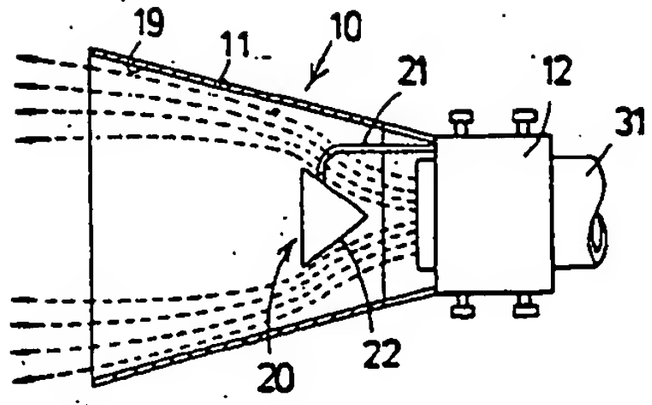


FIG.11

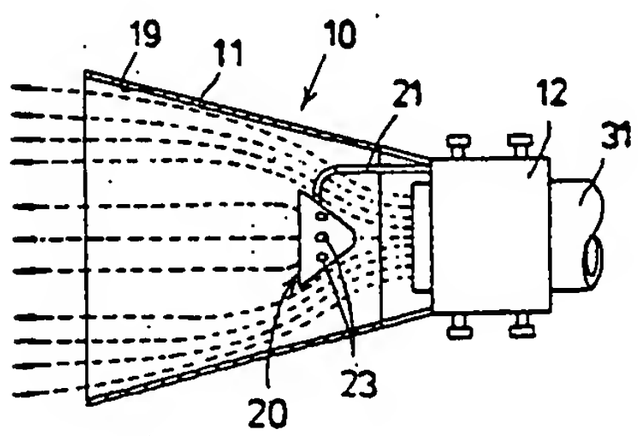


FIG.12